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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BRUTUS, JOEL F	
ART UNIT	**PAPER NUMBER**
3768	

NOTIFICATION DATE	DELIVERY MODE
10/08/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/580,225	UMEMURA ET AL.	
	Examiner	Art Unit	
	JOEL F. BRUTUS	3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _26 May 2009_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-10_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-10_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

Claims 1 and 2 relate to a Doppler velocity detection device without structural limitations and the claims appear to be directed to a method.

Claim 1 is also rejected by not having a preamble which is an essential element. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley et al (US Pat: 5,315,562) in view of Forestieri et al (US Pat: 5,228,009).

Regarding claims 1-6, Bradley et al teach a system and method for measuring velocities using a single coded pulse generator. The correlation device may also

include maximum likelihood estimation techniques for processing the echo signals received from a plurality of transducers (which is an ultrasonic probe, emphasis added). The presently preferred embodiment of the device is as a current profiler having a bottom tracking capability for providing vessel velocity [see abstract]. Bradley et al a current profiler is a type of sonar system that is used to remotely measure water velocity over varying ranges. Current profilers are used in freshwater environments such as rivers, lakes and estuaries, as well as in saltwater environments such as the ocean, for studying the effects of current velocities. The measurement of accurate current velocities is important in such diverse fields as weather prediction; biological studies of nutrients, environmental studies of sewage dispersion, and commercial exploration for natural resources, including oil [see column 1 lines 29-38].

Typically, current profilers are used to measure current velocities in a vertical column of water for each depth "cell" of water up to a maximum range, thus producing a "profile" of water velocities. The general profiler system includes a transducer to generate pulses of sound (which when downconverted to human hearing frequencies sound like "pings") that backscatter as echoes from plankton, small particles, and small-scale inhomogeneities in the water. Two important types of sonar technology that may be used for current profiling are Doppler and correlation. The basic concept of velocity measurement using signal correlation has been known for many years [see column 1 lines 40-50]; display of a host computer [see column 21 lines 35-37] can be use to display or output a 2D or 3D velocity signal (emphasis added). J from the equation represents imaginary unit (emphasis added).

Bradley et al teach as is well-known in the transducer technology, the beam pattern, W (.theta.), where .theta. is the angle of measured energy away from the axis of wave propogation, can be represented as a finite series of Legendre Polynomials with coefficients b sub.n, which thus allows the spacial correlation function to be a function of sum of integrals which involve the Nth term of the beam pattern. (One description of Legendre Polynomial is provided in Mathematical Methods for Physicists by George Arfen, Academic Press, New York, and pp. 534-608.) Calling each of these integrals R.sub.n, in the equation where J is a Bessel function and P is a Legendre polynominal. Thus, the spacial correlation function is the sum of integrals where each b.sub.n is a Legendre Polynomial coefficient, and where .psi. = k[v.sub.x (a.sub.4 -a.sub.1)+v.sub.y (a.sub.5 -a.sub.2)+v.sub.z (a.sub.6 -a.sub.3)]/c, the expression for a correction to the phase corresponding to path differences of order v/c, where v is water velocity and c is the speed of sound in water [see column 13 lines 13-50]

Depending on the parity of the beam pattern term being considered, i.e., n is even or odd, only one of the sums in equation (8) is to be used delta is the total distance away from the bistatic point in all three dimensions and .epsilon is a phase angle describing the relative contribution of vertical and horizontal displacement. In practice, the sums in equation (8) may be truncated after a few terms to obtain an adequate approximation to R.sub.n. Equation (5) is then used to sum over the coefficients of the beam pattern to obtain the final, total correlation value [see column 14 lines 43-57].

Bradley et al don't explicitly mention obtaining velocity signal of the moving reflector on the basis of the ratio between magnitudes of each complex expansion coefficient.

However, Bradley et al teach matrix to average the contents of every nine neighborhood amplitude correlation coefficients. A first moment technique is then used and the results are divided by 2.tau. to obtain an initial estimate of v.sub.x and v.sub.y. The velocity v.sub.z could be set to zero. However, more preferably, the phase shift of the highest correlation coefficient can be used to estimate v.sub.z [see column 18 lines 23-50]. Bradley et al use Legendre polynomial to measure water velocity and suggesting using Doppler for measurement.

However, Forestieri et al teaches a multiple of Legendre polynomials whereas an expansion coefficient of an even-numbered degree term and an expansion of an odd-numbered degree term which is different by one degree and starting from zero, the Legendre polynomials are as follow [see column 8 lines 60-68]:

Po (x) = 1 P1 (x) = x;

P2 (x) = ½(3x^2 -1);

P3 (x) = 1/3(5x^3-3x)

Forestieri et al further teaches an imaginary unit as a coefficient and complex coefficients [see column 9 lines 29-65, column 10 lines 10-60, column 11 lines 60-68]; imaginary portion and real portion [see fig 9a-b]; fitting linear drift of each waveform with sinusoids that have integer numbers of full cycles [see column 8 lines 16-20].

Therefore, one with ordinary skill in the art at the time the invention was made would have been motivated to modify Bradley et al reference by using ratio between magnitude of each complex coefficient; for accuracy purposes because the measurement of accurate current velocities is important in such diverse fields as weather prediction; biological studies of nutrients, environmental studies of sewage dispersion, and commercial exploration for natural resources, including oil [Bradley et al, see column 1 lines 29-38].

Using Legendre polynomial would efficiently remove clutter while minimizing adverse effects to the desired signals. This also has important benefit of requiring less computation time than a power series, thus improving overall performance and reducing the execution time to determine the frequency estimate for a particular sample volume. Allowing higher frame rates of the ultrasonic imaging apparatus without a loss of quality and sensitivity to lower velocity flows are enhanced.

Regarding claims 7-9, all other limitations are taught as set forth by the above teaching.

Bradley et al don't explicitly teach analyzing the velocity of blood flow in a subject and displaying motion velocity image in superimposition.

However, Bradley et al teach the invention could be used in diverse fields as biological studies of nutrients, environmental studies of sewage dispersion and commercial exploration for natural resources, including oil [see column 1 lines 29-38].

Blood carries biological nutrients in human beings and therefore, the invention can also be used to study blood flow in a subject (emphasis added).

However, Forestieri et al teach measuring and imaging blood flow in the human body using Doppler principle wherein a transmitted burst of ultrasound at a specific frequency is reflected from moving blood cells [see column 1 lines 33-39]; color Doppler imaging comprises a probe to send and receive ultrasonic signals, a transmitter/receiver circuitry [see column 1 lines 60-67].

Forestieri et al also teaches a video processor that a circuit to choose whether a given specific part of the two dimensional image has color information resulting from flow or whether it only has echo information from static tissue [see column 3 lines 15-20]; a final composite two dimensional color image showing blood flow in color overlaid on a black and white image represents the velocity of blood flow in vessels or organs [see column 3 lines 23-26]; velocity of a moving target is expressed as meters/seconds [see column 3 lines 58-62]; high pass filters, spectrum form frequency f2 to f3 and very much smaller amplitude [see column 4 lines 1-5]; a velocity estimator, A/D converter [see column 4 lines 36-39]; large signals from stationary or slow moving objects and velocity estimation require many samples to be averaged [see column 4 lines 47-55]; Legendre polynomials [see column 5 lines 45-46]; fig 5 shows spectrum of reflected signals in the form of amplitudes versus time [see fig 5-8]; each data point within a given sample volume shows the motion of that sample volume in the time interval between pulses [see column 7 lines 38-40].

Therefore, one with ordinary skill in the art at the time the invention was made would have been motivated to combine Bradley et al and Forestieri et al by incorporating Bradley et al the measurement of blood flow as taught by Forestieri et al; in order to detect COPD, heart diseases and other arteries related diseases; displaying images simultaneously or side by side; in order to evaluate the procedure by providing important feedbacks as to make necessary modifications and to diagnose the blood flow with accuracy.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley et al (US Pat: 5,315,562) in view of Forestieri et al (US Pat: 5,228,009) as applied to claims 1, 3, 5 above and/or further in view of Wright et al (US Pat: 5,570,691)

Regarding claim 10, all other limitations are taught as set forth by the above teaching.

Bradley et al don't explicitly teach a beamformer.

However, Forestieri et al teach a transmission beam former and reception beam former, ratio between magnitudes of each complex expansion coefficient.

However, Wright et al teaches an ultrasound Doppler imaging and transmit beam former and receive beam former [see fig 1 A-B]; Doppler receive beam former [see fig 2A].

Therefore, one with ordinary skill in the art at the time the invention was made would have been motivated to combine the Bradley et al, Forestieri et al and Wright et

al references by using the beam former; for the purpose of routing the ultrasonic beam into a specific or desired areas.

Response to Arguments

6. Applicant's arguments with respect to claims 1-10 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that Forestieri et al don't teach measuring velocity using Legendre Polynomial.

New reference Bradley et al is relied on for the teaching of measuring velocity using Legendre Polynomial as taught above.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL F. BRUTUS whose telephone number is (571)270-3847. The examiner can normally be reached on Mon-Fri 7:30 AM to 5:00 PM (Off alternative Fri).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on (571)272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. F. B./
Examiner, Art Unit 3768

/Long V Le/
Supervisory Patent Examiner, Art Unit 3768